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**RESEARCH OPPORTUNITIES IN SPACE SCIENCE - 2000  
(ROSS-2000)**

NASA Research Announcement  
Soliciting Basic Research Proposals

NRA 00-OSS-01  
Issued: February 9, 2000

Proposals Due  
Starting April 28, 2000,  
and Ending September 15, 2000

Office of Space Science  
National Aeronautics and Space Administration  
Washington, DC 20546-0001

## RESEARCH OPPORTUNITIES IN SPACE SCIENCE - 2000 (ROSS-2000)

The mission of the Space Science Enterprise of the National Aeronautics and Space Administration (NASA) is to solve the mysteries of the universe, to explore the solar system, to discover planets around other stars, and to search for life beyond Earth. To carry out this mission, NASA's Office of Space Science (OSS) sponsors a broad range of research programs relevant to its four Science Themes, which are defined as:

- *Astronomical Search for Origins & Planetary Systems* (ASO) that addresses the origins of galaxies, stars, proto-planetary and extra-solar planetary systems, Earth-like planets, and the origin of life;
- *Solar System Exploration* (abbreviated as ESS) that seeks to understand all aspects of our Solar System, including the planets, satellites, small bodies, and solar system materials, as well as searching for possible habitats of life beyond Earth;
- *Structure & Evolution of the Universe* (SEU) that involves the study of cosmology, the large scale structure of the universe, the evolution of stars and galaxies, including the Milky Way and objects with extreme physical conditions, and an examination of the ultimate limits of gravity and energy in the Universe; and
- *The Sun-Earth Connection* (SEC) that concerns the Sun as a typical star and as the controlling agent of the space environment of the Solar System, especially the Earth.

Stated in an alternative manner, these four themes seek to answer the four fundamental questions: "How did the Universe begin and evolve?" "Where did we come from?" "Where are we going?" and "Are we alone?"

Further information about these themes may be found through the OSS homepage on the World Wide Web at <http://spacescience.nasa.gov>. In addition, this NRA, entitled "*Research Opportunities in Space Science - 2000 (ROSS-2000)*," may be found by opening "*Research Opportunities*" from the menu at this same Web site.

OSS pursues these fundamental science themes using a wide variety of both space flight programs and investigations in basic science and technology. This NASA Research Announcement (NRA) solicits proposals for Supporting Research and Technology (SR&T) investigations that seek to understand natural space phenomena and space science-related technologies across a full range of science subdisciplines relevant to OSS interests. Table 1 of this cover letter lists all the program components solicited by this NRA in the order of their respective due dates for the submission of proposals. As a guide to their relationships, Table 1 also cross references these program components to the OSS Science Themes as noted above. Appendix A contains detailed descriptions of each component, and questions about each may be directed to the respective Discipline Scientists identified in the text for each.

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### IMPORTANT NEW INFORMATION

The Space Science SR&T program consists of nearly forty distinct subdisciplines and programs. Except for programs involving suborbital rockets, balloons, or a Shuttle flight, where flight opportunities are part of an award, the primary resource to be awarded is funding. The relative distribution of funding among these ~40 SR&T programs, as well as the absolute funding awards, have barely changed during the past decade. Advisory groups have urged the OSS to adjust this SR&T program structure, as well as the funding distribution, to better fit today's science interests and enable tomorrow's research directions. In agreement with these recent recommendations, OSS has begun a process of periodic assessments of the entire Space Science SR&T program. As a first step, the nearly 40 distinct programs have been grouped into nine Clusters, which are listed in the table of contents of Appendix A at the end of this summary cover letter and further discussed in the Introduction to Appendix A. They are arranged primarily by science topic and secondarily by function. For Fiscal Years (FY's) 2000 and 2001, the funding allocated to each Cluster will be exactly equal to the sum of previously planned funds for all individual subdisciplines and programs within each Cluster. The Discipline Scientists for each science Cluster are responsible for allocating funding to the individual programs within their Clusters. To enable possible reallocation of funding within a science Cluster, all proposals within each one may be reviewed at, or nearly at, the same time; therefore, the proposal due dates (see Table 1) are also scheduled to be as simultaneous as possible at the time of this NRA.

Beginning in FY 2001, OSS will convene triennial science reviews, so-called "Senior Reviews," of its entire Space Science SR&T program. These SR&T Senior Reviews will address three questions:

1. Is the Cluster structure optimal, or should the structure and/or content be changed?
2. What was the recent science productivity and quality of each of the Clusters, and what is the outlook for the next few years (based on already selected multiple year awards)?
3. Is the funding distribution among the SR&T Clusters commensurate with their science productivity and relevance to the most recent OSS program strategy, or should there be a re-distribution?

Recommendations from the mid-2001 SR&T Science Reviews will be used to help determine Cluster structure and content, as well as funding for FY's 2002-2004 (October 1, 2001, through September 30, 2003). Questions about this evolving approach to the

restructuring and review of the NASA OSS SR&T program may be directed to:

Dr. Guenter R. Riegler  
Director  
Research Program Management Division  
Office of Space Science  
Code SR  
NASA Headquarters  
Washington, DC 20546  
Telephone: 202-358-1588  
E-mail: guenter.riegler@hq.nasa.gov  
Facsimile: 202-358-3097

Although Table 1 effectively cross-references these newly defined Clusters to many of the traditional ROSS Program Elements and the four OSS Science Themes, the Introduction of Appendix A also provides additional narrative material that expands on these relationships. Therefore, anyone interested in applying to this NRA is urged to read the relevant parts of the Introduction to Appendix A for a full understanding of whether their research interests are relevant to NASA OSS interests, and if so, to which Cluster their proposal should be submitted.

Starting in FY 2001, it is the policy of the Office of Space Science that some portion of the budget of nearly every ongoing research program in this NRA series shall be open for competition for new proposals every year. This is a transition year for this new policy; consult the Cluster(s) of interest for details.

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Appendix B provides the standard NASA guidance for responding to NRA's, and Appendix C provides amendatory guidance to Appendix B for the format and submission requirements for proposals to be submitted to this NRA. Interested proposers should read Appendix C carefully in its entirety before writing their proposals. Special attention is directed to the requirement for the electronic submission of both a Notice of Intent to propose and a combined *Cover Page/Proposal Summary* for the proposal itself.

OSS policy continues to strongly encourage participation by the space science community in education and public outreach activities with the goal of enhancing the formal education system and contributing to the broad public understanding of science. Therefore, proposers to this NRA are encouraged to propose Education/Public Outreach (E/PO) activities that conform to the E/PO guidelines as established by OSS as an addition to any proposal submitted in response to this NRA. The current description of this program appears in Appendix A.10.

Recommendations for funding will be based on the peer evaluation of each proposal's science and technical merits, its relevance to the objectives of the OSS science program element as described in this NRA to which it is submitted, and its requested budget. A

proposed E/PO activity of merit will also be used to discriminate between new proposals of otherwise nominally comparable scientific, programmatic, and financial merits. In all cases, the Government's obligation to make awards is contingent upon the availability of appropriated funds from which payment can be made and upon the receipt of proposals in response to this NRA that NASA determines are acceptable for award.

Participation in this program is open to all categories of U.S. and non-U.S. organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, and other Government agencies. Historically Black Colleges and Universities (HBCU's), other minority educational institutions, and small businesses and organizations owned and controlled by socially and economically disadvantaged individuals or women are particularly encouraged to apply.

#### SPECIAL NOTES:

(1) Because this NRA is released far in advance of the deadlines given in Table 1, additional programmatic information for any given entry may develop before proposals are due. If so, such material will be added as an Amendment to this NRA as posted at its Web site no later than 90 days before the proposal deadline. It is the responsibility of the prospective proposer to check this site for updates concerning the Program Element(s) and Cluster(s) of interest.

(2) OSS now requires the electronic submission of certain elements of proposals through the World Wide Web, and this practice continues with this ROSS-2000 NRA. While every effort is made to ensure the reliability and ease of accessibility of these Web sites, and to maintain "help lines" via E-mail and telephone, difficulty in accessing and/or using these sites may arise at any point on the Internet including the user's own equipment. Therefore, prospective proposers are urged to submit required materials well in advance of the deadlines.

(3) NASA Headquarters is in the process of selecting a new consolidated support contractor who will be responsible for receiving all proposals received by all Headquarters program offices that release program solicitations. Because of the timing of this selection and the release of this ROSS-2000 NRA, it is not possible to provide the delivery address for proposals for some of the Clusters in Appendix A. However, this information will be provided as soon as possible by four different ways: First, an E-mail will be sent to every subscriber to the NASA OSS Electronic Notification system (see "*Get Announcements*" through the menu on the OSS homepage at <http://spacescience.nasa.gov>); second, an electronic notification will be sent to all proposers who submits a Notice of Intent (NOI) to propose for that Cluster or program component; third, this information will be posted at the Web site for this NRA, which may be accessed through the menu listing *Research Announcements* at the Web site given above; and fourth, proposers may directly contact either the Discipline Scientist for the program component of interest in Appendix A or the point of contact for general program/policy information listed below in this cover letter.

The following Summary Information applies to this ROSS-2000 NRA:

- Program alpha-numeric identifier: NRA 00-OSS-01
- Date of NRA issue: February 9, 2000
- Notice of Intent (NOI) to propose –
  - Due date: See Table 1 below.
  - Web site for electronic submission: See individual sections of interest in Appendix A and SPECIAL NOTE (3) above.
- Submission of Proposals –
  - Page limits: See Section C.5.2 in Appendix C.
  - Required number: Signed original plus 15 copies (unless otherwise specified in Appendix A).
  - Due date: See Table 1.
  - Address for submission by mail: See individual sections of interest in Appendix A and also SPECIAL NOTE (3) above.
- Selecting Official: Director  
Research Program Management Division
- Announcement of selections: Goal: 150 days after proposal due date.
- Initiation of funding for new awards: Goal: 29 days after proposal selection.
- Further information -
  - Science Program Elements: Discipline Scientists listed in Appendix A.
  - General NRA procedures: Dr. J. David Bohlin  
Code SR  
Office of Space Science  
National Aeronautics and Space  
Administration  
Washington, DC 20546-0001  
Phone: (202) 358-0880  
E-mail: [david.bohlin@hq.nasa.gov](mailto:david.bohlin@hq.nasa.gov)

Finally, note that NASA OSS maintains an electronic notification system to alert interested subscribers of the impending release of its research program announcements. Subscription to this service is accomplished through the OSS home page at <http://spacescience.nasa.gov> , select the menu item *Get Announcements*, and then follow the instructions within the subsection entitled *Space Science Research Announcements*. Owing to the increasingly multidisciplinary nature of OSS programs, this electronic service notifies subscribers of all future NASA OSS program announcements of any type and objective that are released for any of the OSS science themes (anticipated to be 10 to 20 items per year). Regardless of whether this service is used or not, all OSS research announcements may be accessed and downloaded as soon as they are posted (about 8:30 AM Eastern Time on the day of their release) by linking through *Research Opportunities* on this OSS homepage menu.

Your interest and cooperation in responding to this ROSS-2000 NRA are appreciated. Comments about the nature and/or structure of this inclusive NRA for many of the OSS supporting research and analysis programs are welcome. Such comments may be directed to either the Discipline Scientists identified for each program element in Appendix A or to the point of contact for Programmatic policy/procedures identified above.

Alan N. Bunner  
Science Program Director  
Structure and Evolution of the Universe

Carl B. Pilcher  
Science Program Director  
Solar System Exploration

Anne L. Kinney  
Science Program Director  
Astronomical Search for Origins  
and Planetary Systems

George L. Withbroe  
Science Program Director  
The Sun-Earth Connection

## APPENDICES

Note: As a departure from previous NRA's in this ROSS series, Appendix A is organized into Clusters instead of the four OSS Science Themes (see discussion above); the relationships of the Clusters and Program Elements to the OSS Science Themes are given in the last four columns Table 1.

APPENDIX A.	DESCRIPTION OF SCIENCE CLUSTERS	<u>Page</u>
	<u>INTRODUCTION AND OVERVIEW</u>	
	I. Solar, Heliospheric, and Geospace Sciences	A.I-1
	II. Solar System Sciences	A.I-3
	III. Astrobiology and Planetary Instrumentation	A.I-4
	IV. Space Astrophysics	A.I-5
	V. High Energy Astrophysics	A.I-5
	VI. Interdisciplinary Program Elements	A.I-6
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	A.1.2 Sun-Earth Connection Guest Investigator	A.1-2
	A.1.3 Astrophysics Data	A.1-8
	A.1.4 Long-Term Space Astrophysics	A.1-12
	A.1.5 Astrophysics Theory	A.1-16
A.2	<u>SOLAR AND HELIOSPHERIC SCIENCES</u>	
	A.2.1 Solar Physics Research, Analysis, and Low Cost Access to Space	A.2-1
	A.2.2 Heliospheric Physics	A.2-4
A.3	<u>GEOSPACE SCIENCES</u>	A.3-1
A.4	<u>ORIGIN AND EVOLUTION OF SOLAR SYSTEM BODIES</u>	
	A.4.1 Cosmochemistry	A.4-1
	A.4.2 Planetary Geology and Geophysics (PGG)	A.4-4
	A.4.3 Origins of Solar Systems (OSS)	A.4-10
	A.4.4 Mars Data Analysis (MDA)	A.4-13
	A.4.5 Lunar Data Analysis	A.4-16
A.5	<u>PLANETARY SYSTEMS SCIENCE</u>	
	A.5.1 Planetary Astronomy	A.5-1
	A.5.2. Near Earth Object Observations	A.5-2
	A.5.3 Planetary Atmospheres	A.5-4
	A.5.4 Planetary Suborbital Research	A.5-6

A.6	<u>ASTROBIOLOGY AND PLANETARY INSTRUMENTATION</u>	
A.6.1	Exobiology	A.6-1
A.6.2	Planetary Instrument Definition and Development	A.6-5
A.6.3	Planetary Major Equipment	A.6-10
A.7	<u>SPACE ASTROPHYSICS RESEARCH AND ANALYSIS</u>	A.7-1
A.8	<u>HIGH ENERGY ASTROPHYSICS</u>	
A.8.1	X-ray and Gamma-ray Astrophysics	A.8-1
A.8.2	Cosmic Ray Astrophysics	A.8-4
A.9	<u>INTERDISCIPLINARY PROGRAM ELEMENTS</u>	
A.9.1	Applied Information Systems Research	A.9-1
A.10	EDUCATION/PUBLIC OUTREACH (E/PO) PROGRAM	A.10-1
APPENDIX B.	GENERAL INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS	B-1
APPENDIX C.	SPECIFIC GUIDANCE FOR RESPONDING TO THE ROSS-2000 NRA	C-1

**TABLE 1**

**SCIENCE PROGRAM ELEMENTS SOLICITED IN THE ROSS-2000 NRA**  
(in order of the proposal due dates)

[ASO: Astronomical Search for Origins; SEU: Structure and Evolution of the Universe; ESS: Solar System Exploration; SEC: The Sun-Earth Connection]

Cluster	NRA Appendix	Science Program Element (see Appendix A)	NOI Due Date	Proposal Due Date	Relevant OSS Science Themes			
					ASO	SEU	ESS	SEC
A.5	A.5.1	Planetary Astronomy	3/10/00	4/28/00	X		X	
A.5	A.5.2	Near Earth Object Observations	3/10/00	4/28/00	X		X	
A.5	A.5.3	Planetary Atmospheres	3/10/00	4/28/00			X	
A.5	A.5.4	Planetary Suborbital Research	3/10/00	4/28/00			X	
A.6	A.6.1	Exobiology	3/10/00	4/28/00	X		X	
A.8	A.8.1	X-ray and Gamma-ray Astrophysics	3/10/00	4/28/00		X		
A.8	A.8.2	Cosmic Ray Astrophysics	3/10/00	4/28/00		X		
A.1	A.1.3	Astrophysics Data	3/15/00	5/05/00	X	X	X	
A.1	A.1.4	Long-Term Space Astrophysics	3/15/00	5/05/00	X	X	X	
A.4	A.4.1	Cosmochemistry	3/17/00	5/12/00	X		X	
A.4	A.4.2	Planetary Geology and Geophysics	3/17/00	5/12/00			X	
A.4	A.4.3	Origins of Solar Systems	3/17/00	5/12/00	X		X	
A.4	A.4.4	Mars Data Analysis	3/17/00	5/12/00			X	

**TABLE 1 (continued)**

Cluster	NRA Appendix	Science Program Element (see Appendix A)	NOI Due Date	Proposal Due Date	Relevant OSS Science Themes			
					ASO	SEU	ESS	SEC
A.7	A.7.1	Space Astrophysics Research and Analysis (SARA)*	3/31/00	5/26/00	X	X		
A.1	A.1.2	Sun-Earth Connection Guest Investigator	04/13/00	06/08/00				X
A.3	A.3.1	Geospace Sciences**	5/05/00	7/07/00			X	X
A.1	A.1.5	Astrophysics Theory	5/26/00	7/28/00	X	X		
A.6	A.6.2	Planetary Instrument Definition and Development	6/02/00	8/04/00			X	
A.2	A.2.1	Solar Physics Research, Analysis and Low Cost Access to Space	6/23/00	8/25/00				X
A.2	A.2.2	Heliospheric Physics	6/23/00	8/25/00				X
A.9	A.9.1	Applied Information Systems Research	7/14/00	9/15/00	X	X	X	X

\* The SARA Cluster includes the following Program Elements that were separately identified in previous ROSS NRAs:

- Ultraviolet, Visible, and Gravitational Astrophysics
- Infrared/Submillimeter/Radio/Interferometry Astronomy
- Space Astrophysics Detectors
- Astrophysics Suborbital

\*\* The Geospace Sciences Cluster includes the following Program Elements that were separately identified in previous ROSS NRAs:

- Ionospheric, Thermospheric, and Mesospheric (ITM) Physics
- Magnetosphere Physics
- Magnetospheric and ITM Low Cost Access to Space